

Point-by-point replies to the comments

1. Topical Editor decision: Reconsider after major revisions

by Bethanna Jackson 28 Feb 2022

Comments to the author:

Dear authors, I think this paper is significantly improved and I do think we can get it over the line to just technical or minor revisions if not immediate acceptance with one more iteration if you are willing to put an effort into this further iteration in. When I first accepted it for review, I thought there were both many strengths but also some significant weaknesses and most of these latter are now addressed. I want to acknowledge to you I feel the process of taking it to publication is more complex than usual, not through any faults of yours. Not just because of some translation issues into English, but also because karst as you know is complex and geospatially variable. You have had some very competent and constructive reviews from experts in European and other global karst landscapes and I suspect (partially from reading your descriptions, and also from one trip to China where I viewed karst landscapes among others) that you have differences in the overall qualities and responses of the karst landscapes versus those published in the English literature. It's great you have brought in the English literature, and please don't hesitate to add into the paper differences between karst descriptions and behaviours in that published literature and what you are trying to model- that may really help later authors to reference descriptions of Chinese/other less published specific karstic landscapes. Very best wishes, Beth

2. Anonymous Reviewer #1, 20 Sep 2021

The paper concerns a topic consistent with the aim of the GMD journal, and I really appreciate the huge work made by the authors. The presented analysis and model application could be potentially useful in karst basins. In this study, a karst hydrological model, i.e., the QMG model-V1.0 was developed for karst floods simulation and forecasting. The model itself is a valuable improvement, and what interested me was the applicability of the model in karst areas, so I went through the entire process of modeling and validating the model myself (<https://zenodo.org/deposit?page=1&size=20>), and the model simulation results were satisfactory. I think the subsequent research should focus on the validation study of the model in more karst areas to prove its general applicability in karst hydrological forecasting. However, there are few drawbacks affect the manuscript and have to be addressed before the paper can be published in GMD.

Specific comments

1) English needs modification

I found several incorrect words, grammar and unclear sentences, make it very difficult to

understand the analysis carried out and the results obtained. The authors need to carefully correct the language errors in the whole text.

2) More information about the potential of this new model, i.e., the QMG model-V1.0 for application in karst areas needs to be added in the Introduction part, especially the advantages and disadvantages compared to current numerical karst groundwater models.

3) In the Methodology part, the section 3.1 Hydrological model, this title is inappropriate here, as it obviously also includes the Parameter Optimization in Section 3.2 and Model Setting in 3.4. Suggest changing it to a model framework and algorithm.

4) In section 3.3 Uncertainty Analysis, it is not clear how to analyze uncertainty in input data and model structure for this new QMG model-V1.0.

Other minor comments

1) All tables should be set to three-line tables.

2) The right side of Figure 3 seems to be a photograph, please explain the necessity of its existence.

3) Each variable in Figure 5 needs to be clearly labeled as to which parameter it refers to.

4) The horizontal axis in Figure 7 represents the date, but the interval is not one-to-one with the marked time, please check that.

Anonymous Reviewer #2, 19 Feb 2022

The paper deals with implementation of a physically-based distributed karst hydrological model for flood simulations. The manuscript has several deficiencies, in part depending upon the English language and in part by problems with the scientific content.

I have a number of considerations and suggestions (presented in this comment, and in the attached file as well).

In general, the English language seems to me not satisfying the international standards for publication in several points, and needs some deep revision. In particular, I pointed out in the attached file some parts where the English was unclear to me.

Authors are probably not very familiar with karst literature and terminology. Since they are proposing a model for floods in karst, the karst literature cannot be not taken into

account. From the beginning, it is stated that the work regards “karst through valley”.

This is not a term familiar to me, and I do not have seen it used in the karst literature.

Thus, its meaning should be clearly defined. In addition, references to the main works and textbooks as concerns karst landforms and morphology should be added. Below you will find some suggestions at this regard.

As regards the main topic of the article, that is floods, karst settings are typically characterized by flash floods, due to the lack or scarcity of water at the surface during most of the year. This is never mentioned in the manuscript, but should deserve some mention, also to cite similar examples in other karst areas worldwide. For instance, have a look at the paper by Gutierrez et al. (2014) and the abundant references about floods in karst (Parise, 2003; Bonacci et al., 2006; Jourde et al., 2007, 2014; Martinotti et al., 2017).

Also when dealing with sinkholes, no reference to the main classification of sinkholes is provided. All this indicates a quite poor knowledge of karst, which should be addressed for an article submitted to international journals.

Suggested references for karst (general textbooks and specific articles for floods and hazards in karst):

Bonacci, O., Ljubenkov, I., Roje-Bonacci, T., 2006. Karst flash floods: an example from the Dinaric karst Croatia. *Nat. Hazards Earth Syst. Sci.* 6, 195–203.

Ford, D.C., Williams, P., 2007. *Karst Hydrogeology and Geomorphology*. Wiley, Chichester, 562 pp..

Gutierrez, F., 2010. Hazards associated with karst. In: Alcantara, I. & A. Goudie (Eds.), *Geomorphological Hazards and Disaster Prevention*. Cambridge University Press, Cambridge, 161–175.

Gutierrez F., Parise M., De Waele J. & Jourde H., 2014, A review on natural and human-induced geohazards and impacts in karst. *Earth Science Reviews*, vol. 138, p. 61-88.

- Jourde, H., Roesch, A., Guinot, V., Bailly-Comte, V., 2007. Dynamics and contribution of karst groundwater to surface flow during Mediterranean flood. *Environ. Geol.* 51 (5), 725–730.
- Jourde, H., Lafare, A., Mazzilli, N., Belaud, G., Neppel, L., Doerfliger, N., Cernesson, F., 2014. Flash flood mitigation as a positive consequence of anthropogenic forcings on the groundwater resource in a karst catchment. *Environ. Earth Sci.* 71, 573–583.
- Martinotti M.E., Pisano L., Marchesini I., Rossi M., Peruccacci S., Brunetti M.T., Melillo M., Amoruso G., Loiacono P., Vennari C., Vessia G., Trabace M., Parise M., & Guzzetti F., 2017, Landslides, floods and sinkholes in a karst environment: the 1–6 September 2014 Gargano event, southern Italy. *Natural Hazards and Earth System Sciences*, vol. 17, p. 467-480.
- Palmer, A.N., 2007. *Cave Geology*. Cave Books, Dayton, 454 pp..
- Palmer, A.N., 2010. Understanding the hydrology of karst. *Geol. Croat.* 63, 143–148.
- Parise, M., 2003. Flood history in the karst environment of Castellana-Grotte (Apulia, southern Italy). *Nat. Hazards Earth Syst. Sci.* 3 (6), 593–604.
- Parise, M., 2010, Hazards in karst, *Proceedings Int. Conf. “Sustainability of the karst environment. Dinaric karst and other karst regions”*, IHP-Unesco, Series on Groundwater, 2, 155-162.
- Parise M., Ravbar N., Ćizvanovic V., Mikszewski A., Kresic N., Mádl-Szo ĩnyi J. & Kukuric N., 2015, Hazards in Karst and Managing Water Resources Quality. Chapter 17 in: Z. Stevanovic (ed.), *Karst Aquifers – Characterization and Engineering*. Professional Practice in Earth Sciences, Springer, pp. 601-687.
- White, W.B., 1988. *Geomorphology and Hydrology of Karst Terrains*. Oxford University Press, Oxford, 464 pp.
- White, W.B., 2002. Karst hydrology: recent developments and open questions. *Eng. Geol.* 65, 85–105.

Williams, P.W., 2008. The role of the epikarst in karst and cave hydrogeology: a review.

Int. J. Speleol. 37, 1–10.

Zhou W, Beck BF (2011) Engineering issues on karst. In: P. van Beynen (Ed), Karst Management. Springer, Dordrecht, 9-45.

Please also note the supplement to this comment:

<https://gmd.copernicus.org/preprints/gmd-2021-120/gmd-2021-120-RC2-supplement.pdf>

Response to Topical Editor' comments

First, many thanks to the Topical Editor for acknowledging that this paper has been significantly improved. We are willing to revise and improve this paper based on the comments of the reviewers and Editor. Indeed, as stated by the Editor-in-Chief, karst geography is complex and variable. There are differences in the overall quality and response of the karst landscape versus those published in the literature.

In the revised manuscript, we have added the differences between karst descriptions and behaviours in the published literature and those in our QMG model in this karst study area. For instance, the karst trough landform in this area looks like a pen-holder structure, means 'three ridges with two troughs' (Lines 149-151). which provides convenient conditions for flood propagation and formation. Such trough and valley landforms may not be common in other karst regions of the world, but they are common and typical in the karst regions of southwest China, especially Chongqing. In addition, both reviewers pointed out that the English language in the paper requires substantial improvement to enhance readability. In particular, the second reviewer highlighted the irregular use of karst terminology in the manuscript, which resulted in the article appearing unprofessional. Therefore, we have carefully revised the English language errors in this paper, especially the karst terminology, and asked a professional English editing company (Charlesworth Advanced) to help fix the language problems in the text so that readers can better understand the ideas and scientific conclusions expressed in this manuscript.

Response to the comments of Anonymous Reviewer #1

General comment:

The paper concerns a topic consistent with the aim of the GMD journal, and I really appreciate the huge work made by the authors. The presented analysis and model application could be potentially useful in karst basins. In this study, a karst hydrological model, i.e., the QMG model-V1.0 was developed for karst floods simulation and forecasting. The model itself is a valuable improvement, and what interested me was the applicability of the model in karst areas, so I went through the entire process of modeling and validating the model myself (<https://zenodo.org/deposit?page=1&size=20>), and the model simulation results were satisfactory. I think the subsequent research should focus on the validation study of the model in more karst areas to prove its general applicability in karst hydrological forecasting. However, there are few drawbacks affect the manuscript and have to be addressed before the paper can be published in GMD.

Response:

We greatly appreciate the reviewer's comments. The reviewer confirmed the innovation and application value of this study, noted the potential of the model (QMG model-V1.0) proposed in karst areas and suggested that subsequent studies should focus on applying this new model to more karst areas to test its general applicability in karst flood forecasting.

The next step in our research is indeed focused on model validation, for which we will build this model (QMG model-V1.0) for flood simulation and forecasting in more karst areas and improve the model's functions and algorithms to enhance its applicability and accuracy.

Point-by-point responses to your specific comments are given below.

Specific Comment

1) English needs modification

I found several incorrect words, grammar and unclear sentences, make it very difficult to understand the analysis carried out and the results obtained. The authors need to carefully correct the language errors in the whole text.

Response:

We have carefully revised the language errors in the full text, including incorrect words, grammar errors and unclear sentences, and asked a professional English editing company (Charlesworth Advanced) to help fix the language problems in the manuscript.

2) More information about the potential of this new model, i.e., the QMG model-V1.0 for application in karst areas needs to be added in the Introduction part, especially the advantages and disadvantages compared to current numerical karst groundwater models.

Response:

More information about the advantages of the QMG model-V1.0 compared with other karst groundwater models has been added to the revised Introduction (Lines 118-130).

3) In the Methodology part, the section 3.1 Hydrological model, this title is inappropriate here, as it obviously also includes the Parameter Optimization in Section 3.2 and Model Setting in 3.4. Suggest changing it to a model framework and algorithm.

Response:

This advice is very valuable. The title of section 3.1 has been replaced with “Hydrological model framework and algorithms” accordingly (Lines 239).

4) In section 3.3 Uncertainty Analysis, it is not clear how to analyze uncertainty in input data and model structure for this new QMG model-V1.0.

Response:

Uncertainty analyses of the input data and model structure have been added to the revised section 3.3 (Lines 491-506).

Other minor comments

1) All tables should be set to three-line tables.

Response:

The tables have been converted to three-line tables accordingly (Lines 1071-1074).

2) The right side of Figure 3 seems to be a photograph, please explain the necessity of its existence.

Response:

The image shows a three-dimensional spatial model of KHRUs established in the laboratory to visually reflect the storage and movement of water in a karst water-bearing medium with spatial anisotropy and to provide technical support for the establishment of a hydrological model. This description has been added to the revised version of the paper (Lines 265-268).

3) Each variable in Figure 5 needs to be clearly labeled as to which parameter it refers to.

Response:

The model parameter denoted by each variable in Figure 5 is clearly listed in Table 1 (Lines 1099).

4) The horizontal axis in Figure 7 represents the date, but the interval is not one-to-one with the marked time, please check that.

Response:

The horizontal axis in Figure 7 has been revised accordingly (Lines 1103-1119).

Response to the comments of Anonymous Reviewer #2

The paper deals with implementation of a physically-based distributed karst hydrological model for flood simulations. The manuscript has several deficiencies, in part depending upon the English language and in part by problems with the scientific content.

I have a number of considerations and suggestions (presented in this comment, and in the attached file as well).

Response:

We greatly appreciate the reviewer's comments. The reviewer noted that there are two major deficiencies in this manuscript related to the English language errors and the scientific content problems. We have carefully revised the problems highlighted by the reviewer. Point-by-point responses to your specific comments are given below.

Specific Comment

1) English language errors

In general, the English language seems to me not satisfying the international standards for publication in several points, and needs some deep revision. In particular, I pointed out in the attached file some parts where the English was unclear to me.

Response:

We apologize for the poor English language in the text and have edited the manuscript further based on your helpful comments. The first reviewer also suggested that the English language problems in the manuscript be revised. Therefore, we have carefully addressed the language errors in the full text, including incorrect words, terminology, grammar errors and unclear sentences. We used a professional English editing company (Charlesworth Advanced) to

help fix the language errors in the manuscript.

2) Terminology problems

Authors are probably not very familiar with karst literature and terminology. Since they are proposing a model for floods in karst, the karst literature cannot be not taken into account. From the beginning, it is stated that the works regards “karst though valley”.

This is not a term familiar to me, and I do not have seen it used in the karst literature.

Thus, its meaning should be clearly defined.

Response:

As mentioned above, we have corrected the terminology errors in the text; for instance, “karst trough valley” was replaced with “karst trough and valley landform” (Lines 42), and “skylights” was replaced with “karst windows” (Lines 322).

3) References

In addition, references to the main works and textbooks as concerns karst landforms and morphology should be added. Below you will find some suggestions at this regard.

Response:

The reviewer noted that the literature citations are inadequate, and references to karst landforms and morphology should be added. Thus, we have added some relevant citations based on your suggestions (most of them were added in the Introduction, for example, on Lines 46, 54-55, 59, and Lines 63-64).

As regards the main topic of the article, that is floods, karst settings are typically characterized by flash floods, due to the lack or scarcity of water at the surface during most of the year. This is never mentioned in the manuscript, but should deserve some mention, also to cite similar examples in other karst areas worldwide. For instance, have a look at the paper by Gutierrez et al. (2014) and the abundant references about floods in karst (Parise, 2003; Bonacci et al., 2006; Jourde et al., 2007, 2014; Martinotti et al., 2017).

Response:

The coexistence of drought and flooding is a typical phenomenon in karst areas, and indeed, as the reviewer stated, water shortages in karst areas occur most of the year. Therefore, water scarcity problems are added in the text (Lines 43-44 and 46-48), and some relevant literature has been added accordingly (Lines 46).

Also when dealing with sinkholes, no reference to the main classification of sinkholes is provided. All this indicate a quite poor knowledge of karst, which should be addresses for an article submitted to international journals.

Response:

References related to the classification of karst sinkholes have been added in the revised version of the paper (Lines 174 and Lines 214-220).

Suggested references for karst (general textbooks and specific articles for floods and hazards in karst):

Bonacci, O., Ljubenkovic, I., Roje-Bonacci, T., 2006. Karst flash floods: an example from the Dinaric karst Croatia. *Nat. Hazards Earth Syst. Sci.* 6, 195–203.

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Zhou W, Beck BF (2011) Engineering issues on karst. In: P. van Beynen (Ed), *Karst Management*. Springer, Dordrecht, 9-45.

Response:

Some of the abovementioned references for karst have been added to the article (for example, the references for Lines 883-884, 931-935, 946-951, and 1003-1010, etc.), and the corresponding literature has also been added to the text.

Please also note the supplement to this comment:

<https://gmd.copernicus.org/preprints/gmd-2021-120/gmd-2021-120-RC2-supplement.pdf>

Response:

We have carefully revised the errors based on the comments in the supplemental file (gmd-2021-120-RC2-supplement.pdf), and these changes have been highlighted in revision mode (a marked-up manuscript.docx).